Determination of the Polarization of the Decay Positrons in Polarized Muon Decay

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In the standard model of electroweak interactions in the positrons from the decay of polarized positive muons are mainly longitudinally polarized. The measurement of the two transverse polarization components P_{T_1}, which lies in the plane spanned by muon-spin and positron momentum, and P_{T2}, which is perpendicular to this plane, is a sensitive tool to look for contributions from additional, exotic interactions.

The energy dependence of the transverse polarization components yields the Michel parameters η, η'', α'/A and β'/A. The low energy parameter η can be used to derive an improved model-independent value of the Fermi coupling constant. A non-zero value of P_{T2} would be the first observation of time reversal violation in a purely leptonic decay.

The μP_T- experiment at the Paul Scherrer Institute is the first experiment to measure all three positron polarization components, P_{T_1}, P_{T2}, and the longitudinal polarization component P_L, simultaneously.

The first results evaluated on a basis of GEANT with full spin-dependence implemented will be presented. Descriptions of the new methods applied will be given along with preliminary results.